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Low Rates of Cutaneous Adverse Reactions to Alcohol-Based Hand Hygiene Solution during Prolonged Use in a Large Teaching Hospital

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We assessed cutaneous adverse reactions (CARs) to alcohol-based hand rub (ABHR) after the introduction of a hand hygiene culture change program at our institution. CARs were infrequent among exposed health care workers (HCWs) (13/2,750; 0.47%; 1 CAR per 72 years of HCW exposure) and were not influenced by the duration or intensity of ABHR use but were associated with the presence of irritant contact dermatitis.

Health care worker (HCW) use of alcohol-based hand rub solution (ABHR) has been associated with increased hand hygiene compliance and reduced rates of nosocomial infection in a multimodal hospitalwide program, so that Centers for Disease Control and Prevention guidelines now recommend its routine use (2, 11). Nevertheless, adherence to appropriate hand hygiene practices remains variable, with concerns about potential cutaneous adverse reactions (CARs) one of the stated reasons for limited compliance (2, 11).

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Since December 2001, we have introduced an ABHR (De-Bug; isopropyl alcohol, 70% [vol/vol]; chlorhexidine gluconate, 0.5% [wt/vol]; with emollient) and a culture change program similar to that undertaken by Pittet et al. (11) in our hospital, including an institutionwide credentialing program to ensure that all HCWs have an improved understanding of the benefits of ABHR use and the need to voluntarily report any adverse reactions. During the 24 months after commencement, all HCWs who reported ABHR-associated CARs that were persistent and/or that restricted their use of ABHR were referred to one occupational dermatologist (R. Nixon), who used standard criteria and methods, including skin patch testing when required, to diagnose the nature of the CARs (10). To assess the nature and frequency of CARs to ABHR, we correlated these with the duration and intensity of ABHR use.

We analyzed these dermatological findings according to the number of HCWs exposed to ABHR use to estimate an overall rate of adverse reactions (number of CARs per number of HCWs exposed). In the nine study wards for which we had detailed site-specific ABHR usage data, we also analyzed the number of CARs with respect to the duration of ABHR exposure (expressed as HCW years of exposure). This was calculated using staffing rosters for nurses and patient service attendants (PSAs) and the known duration that ABHR had been available on that ward during the study period. One HCW year of exposure was defined as 47 weeks (40 h per week) of work in a ward in which the ABHR had been introduced. We limited these analyses to HCWs who were nurses or PSAs, since our previous hand hygiene compliance studies had shown that their use of ABHR was more predictable (approximately 60% compliance) than for other HCWs (P. D. R. Johnson, B. C. Mayall, E. A. Grabsch, et al., Abstr. 44th Intersci. Conf. Antimicrob. Agents Chemother., abstr. K-1858, 2004). We also monitored CARs among other HCWs (e.g., doctors, physiotherapists, and occupational therapists), but since their patient contact time and therefore use of ABHR was less predictable, a rate of CARs for these HCWs could not be accurately determined. In addition, we used hospital supply data to assess the rate of CARs according to the intensity of ABHR exposure (expressed as the number of CARs per number of liters of ABHR used per 1,000 bed days), with usage averaged over the entire study period to account for month-to-month variations in ordering.

Among the 2,750 HCWs (nurses and PSAs) who potentially used ABHR during the study period, only 13 (0.47%) reported a CAR, and none reported any noncutaneous adverse reactions. In addition, a CAR was reported by one physiotherapist, but no other HCW group reported CARs. Thirteen of these HCWs had irritant contact dermatitis, including nine who had a history of preexisting skin problems, such as dermatitis/eczema and ill-defined adverse reactions to various products. All HCWs with irritant contact dermatitis were advised to increase the use of skin moisturizers, so that at follow-up 9 months later, three HCWs used ABHR routinely without problems, seven used ABHR intermittently, and the remainder avoided ABHR use. One of 14 HCWs had preexisting allergic contact dermatitis and had positive patch test results to multiple allergens decided to avoid future use of ABHR, despite the fact that alcohol and chlorhexidine were not thought to be responsible for her symptoms. One HCW with irritant contact dermatitis found that ABHR use helped her hands.

Analysis of these data with respect to duration of ABHR use suggested that the risk of CARs at our institution was one CAR for every 72 years of HCW exposure and that longer-duration ABHR use did not correlate with higher rates of

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TABLE 1. Rate of cutaneous adverse reactions to ABHR among HCWs based on ward area and duration and intensity of ABHR use

Parameter	Level 8[a]	Level 9[b]	Renal	Spinal	ICU[c]
No. of HCWs[d] affected	2	5	0	1	0
Duration of exposure to ABHR (mo)	24.6	21.6	9.8	14	17.2
No. of HCW shifts/day	68	65	32	25	41
HCW years of exposure	216	182	41	45	91
Mean vol of ABHR used (liters per 1,000 bed days)	17.5	18.8	23.8	28.2	71.1

[a] Level 8 includes the following five units: Liver Transplantation, Gastroenterology, Vascular Surgery, Urology, and General Surgery.
[b] Level 9 includes the following four wards: Respiratory Medicine, Cardiac/Thoracic Surgery, Cardiology, and Orthopedics.
[c] ICU, intensive care unit.
[d] For this analysis, HCWs were defined as nurses or PSAs. A further five HCWs who did not work on these study wards reported CARs (see the text).

CARs (Table 1). Similarly, the rate of CARs did not correlate with the intensity of ABHR use; although the volume of ABHR used varied from 17.5 to 71.1 liters per 1,000 patient bed days in different ward areas, the higher-use areas were not associated with higher rates of CARs (Table 1). Notably, among HCWs reporting CARs, all but one had symptom onset within the first month of ABHR use (>50% had symptoms within the first week).

This is the largest reported study to systematically assess the risk of adverse reactions to ABHR and highlights the overall low risk of CARs (0.47%) during routine use, with neither the duration nor the intensity of ABHR use associated with increased risk. Notably, we did not identify any severe CARs among our HCWs, unlike one previous study (3). Similar to some previous general reports that have identified high rates of irritant contact dermatitis among HCWs with skin problems (4, 5), our study identified irritant contact dermatitis as the main problem among the majority of HCWs who reported CARs to ABHR, and this condition may have been present for years prior to the use of ABHR. Not surprising, the presence of preexisting skin irritation has been closely linked to an increased susceptibility to irritation by alcohol (8, 9). While our findings are consistent with previous reports that show ABHR with emollient to be better tolerated by HCWs than washing with either unmedicated or medicated soap (1, 6, 7, 11, 12), our findings are contrary to the high rate of CARs reported in a relatively small study of HCWs by Cimiotti et al. (3).

Potential limitations of our study include the fact that we relied on voluntary reporting of adverse reactions by HCWs; however, given the detailed nature of our education program and the daily presence of our hand hygiene study nurses in most wards, we believe HCW reporting of significant adverse reactions was complete. However, we cannot be certain that all minor CARs were reported or that some reported CARs were not due to the use of other hand hygiene products, such as unmedicated soap or 4% chlorhexidine, which remained available on our wards. Secondly, we were unable to control for the possible transfer of nurses between wards, although we believe this to have been limited. In addition, although we found no correlation between duration of ABHR use and frequency of CARs for each ward area, we do not have individual data for the duration of ABHR use for each HCW, including those who may have worked part time rather than full time. Nevertheless, we believe our study has important implications for other institutions planning the widespread use of ABHR, since it highlights the safety of such products but reinforces the importance of HCW education regarding the recognition and management of irritant contact dermatitis, which appears to be the most frequently identified skin condition that limits the use of ABHR.

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